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THE GENUS *PROTOLOPHUS* (PHALANGIDA)

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The genus *Protolophus* was erected by Banks in 1893 to include two western species which he named *Protolophus tuberculatus* and *Protolophus singularis*. In 1925 Chamberlin described another species, *dixiensis*, from Utah.

The writers in studying the collection of harvestmen at The American Museum of Natural History encountered three new species, two related to *tuberculatus* and the third showing close affinities to *dixiensis*. The types of these new species are deposited in the collection of the American Museum.

The characters of the genus as here amended are:

PROTOLOPHUS BANKS, 1893

Protolophus BANKS, 1893, Canadian Ent., XXV, p. 206.—Amer. Nat., XXXV, p. 672.—ROEWER, 1910, Abh. Ver. Hamburg, XIX, p. 263.—BANKS, 1911, Pomona, J. Ent., III, p. 419.—COMSTOCK, 1913, The Spider Book, p. 86; 1940, p. 86.—ROEWER, 1923, Die Weberknechte der Erde, p. 874.—CHAMBERLIN, 1925, Bull. Mus. Comp. Zool., LXVII, p. 206.

Tarsus of the male palpus narrowing abruptly, giving a characteristic appearance; palpus of the female with the patella prolonged into a spur on the inner side; tarsal claw small and smooth. Maxillar lobes of the second coxae straight. The first five segments of the abdomen each bearing a median pair of large tubercles. Eye tubercle spinose; anterior margin of cephalothorax bearing a few small spines. Rows of teeth present on the lateral margins of several coxae.

KEY TO MALES OF *Protolophus*

- 1.—(a) Median abdominal tubercles bearing spines.....2.
- (b) Median abdominal tubercles without spines.....4.
- 2.—(a) Femur of palpus very heavy, 1.1 mm. in width.....*P. singularis*.
- (b) Femur of palpus normal, 0.7 mm. or less in width.....3.
- 3.—(a) Legs with a definite annulate appearance. Color of animal brownish.....*P. dixiensis*.

- (b) Legs mottled, but not annulate, color of animal grayish.....*P. differens*.
- 4.—(a) Median abdominal tubercles scarcely elevated above the surface of the dorsum.....*P. niger*.
- (b) Median abdominal tubercles distinctly elevated above the surface of the dorsum.....5.
- 5.—(a) Femur, patella and tibia of legs black.....*P. tuberculatus*.
- (b) Femur, patella and tibia of legs brown or yellow.....*P. cockerelli*.

It is a pleasure to acknowledge the kind permission of The American Museum of Natural History to examine specimens, and for the loan of space and equipment. The writers also wish to acknowledge the help and encouragement of Dr. W. J. Gertsch.

Protolophus singularis Banks, 1893

Figure 1

P. singularis BANKS, 1893, Canadian Ent., XXV, p. 207; 1901, Amer. Nat., XXXV, p. 674; 1904, Proc. Calif. Acad. Sci., (3) III, p. 13. Pl. xxxviii, fig. 19.—ROEWER, 1910, Abh. Ver. Hamburg, XIX, p. 265.—BANKS, 1911, Pomona J. Ent., III, p. 419, Fig. 151.—COMSTOCK, 1912, The Spider Book, p. 87; 1940, p. 87.—ROEWER, 1923, Die Weberknechte der Erde, p. 874, Fig. 1037.

MALE.—Total body length, 5.5 mm. Cephalothorax, 1.8 mm.

	I	II
Trochanter	1.1 mm.	1.1 mm.
Femur	3.5	5.1
Patella	1.3	1.4
Tibia	3.2	4.7
Metatarsus	3.6	5.2
Tarsus	5.4	10.4
Total	18.1 mm.	27.9 mm.
	III	IV
Trochanter	1.1 mm.	1.1 mm.
Femur	3.6	4.1
Patella	0.9	1.1
Tibia	2.7	3.6
Metatarsus	4.6	6.5
Tarsus	5.4	7.7
Total	18.3 mm.	24.1 mm.

Dorsum granulate, numerous irregularly spaced tubercles on the median frontal margin of the cephalothorax. Abdomen with a pair of tubercles on the first five abdominal segments; each tubercle armed with from 2-4 small black spines. Eye tubercle low, not canaliculate, a ring of black spinous tubercles around each eye. Venter slightly tuberculate, hairy. Coxae tuberculate and covered with black hair, rows of teeth present on anterior and posterior margins of legs I, II and IV. Present only on anterior margin of leg III. Genital operculum tuberculate and with scattered hairs; teeth along lateral margins. Supra-chelicer al lamella reduced to two small projections on either side of the median line. Body subtruncate as seen from above.

Palpus: trochanter, 1.2 mm. long; femur, 2.7; patella, 1.0; tibia, 2.7; and tarsus, 1.3. Total, length, 8.9 mm. Width of femur, 1.1 mm. Femur curved, dorsal surface armed with a few hairs, ventral and lateral areas covered with hair and heavy tubercles. Patella and tibia armed dorsally with scattered hairs, armed ventrally with hair and tubercles. Tarsus narrow, armed dorsally with hair, ventrally with two marginal rows of black-tipped tubercles. Tarsal claw smooth and small.

Legs: trochanters smooth except for small black hairs, remainder of legs having scattered hairs and tubercles, otherwise smooth.

Dorsum brownish, mottled black and white. Abdominal tubercles black. Eye tubercle black, lighter at base. Venter uniform yellowish brown, coxae yellowish, legs brown with mottled lighter portions scattered irregularly. Does not give ringed appearance to legs. Palpus also brownish yellow, shading to lighter color distally. Also mottled with lighter markings, especially on the femur.

FEMALE.—Total body length, 7.4 mm. Cephalothorax, 1.8 mm.

Female as male, except abdomen more strongly arched and rounded behind. Eye tubercle lighter than in male. Patella of palpus with characteristic spur. Palpus more strongly mottled.

TYPE LOCALITY.—Southern California (Banks, 1893).

RECORDS.—CALIFORNIA: Los Angeles, Claremont. ARIZONA: Bear Wallow, Santa Catalina Mountains; near Ranger Station, Mt. Lemmon, Santa Catalina Mountains; NE. White River, White Mountains; McKay's Peak, White Mountains. UTAH: St. George.

Protolophus dixiensis Chamberlin, 1925

Figure 3

P. dixiensis CHAMBERLIN, 1925, Bull. Mus. Comp. Zool., LXVII, p. 206.

MALE.—Total body length, 5.2 mm. Cephalothorax, 1.8 mm.

	I	II
Trochanter	0.6 mm.	0.6 mm.
Femur	3.6	6.3
Patella	1.4	1.4
Tibia	3.2	4.8
Metatarsus	3.6	6.8
Tarsus	4.5	9.0
Total	16.9 mm.	28.9 mm.
	III	IV
Trochanter	0.6 mm.	0.6 mm.
Femur	3.9	5.2
Patella	1.4	1.1
Tibia	2.9	4.5
Metatarsus	5.2	7.4
Tarsus	5.6	7.7
Total	19.6 mm.	26.5 mm.

Dorsum only faintly granulate. Eye tubercle low, a row of numerous spinous tubercles over each eye, not canaliculate. A series of black-tipped spines on the anterior margin of the cephalothorax, extending posterior to the eye in three rows. Supra-chelicer al lamella in the form of a short spine on either side of the median line. Body subtruncate as seen from above. Abdomen with a pair of tubercles on the first five segments, each tubercle bearing from 5-10 small black spines. Venter smooth. Coxae with rows of teeth on the anterior and posterior margins of I, II and IV; anterior margin only of III. Genital operculum with lateral rows of teeth, also having numerous black hairs.

Palpus: trochanter, 0.6 mm. long; femur, 1.9; patella, 0.6; tibia, 1.8; and tarsus, 1.7. Total length, 6.6 mm. Femur, 0.7 mm. wide. Femur curved, dorsal surface smooth, ventral and lateral surfaces covered with hair and tubercles. Patella and tibia armed dorsally with scattered hairs, ventrally with hair and tubercles. Tarsus narrow, armed dorsally with hair, ventrally with two marginal rows of black-tipped tubercles. Tarsal claw smooth and small.

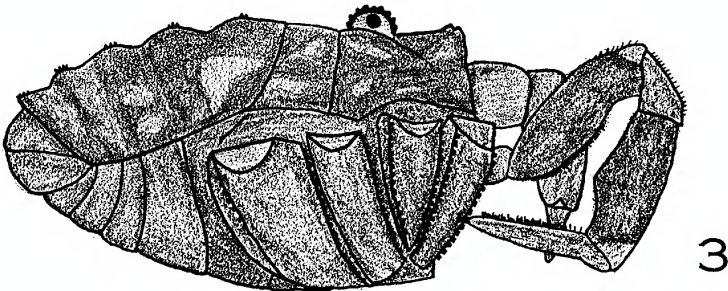
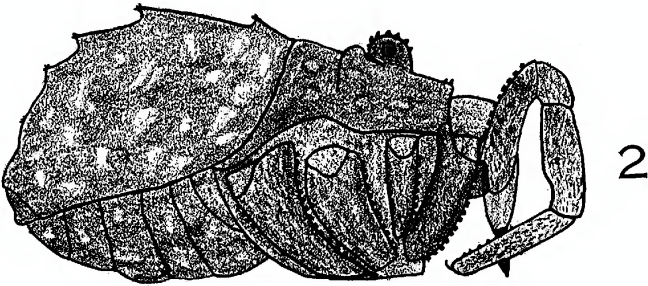
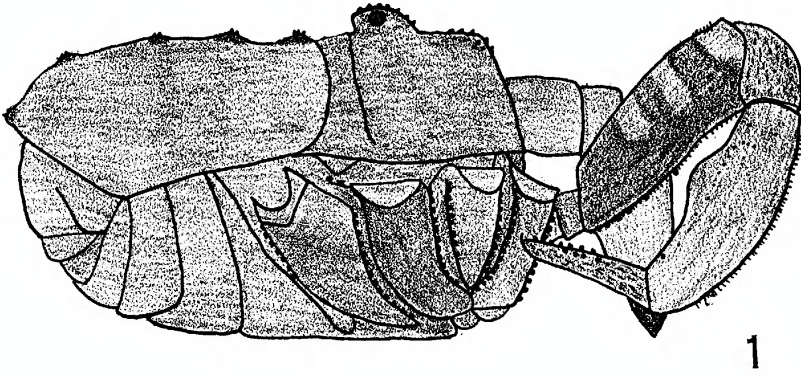
Legs: trochanters smooth except for black hairs, legs smooth except for scattered hairs.

Dorsum grayish brown, with numerous mottlings of white. Eye tubercle dark brown shading into black around the eyes. Venter brownish, trochanters yellow, legs brownish yellow, with numerous black and white mottlings which give an annulate appearance to the legs. Palpus yellowish brown, tarsus paler.

FEMALE.—Total body length, 7.4 mm. Cephalothorax, 2.3 mm.

As male except grayer in appearance, abdomen more strongly arched, rounded behind. Palpi having the characteristic patella spur, mottled with white.

TYPE LOCALITY.—Zion National Park, Utah (Chamberlin, 1925). Numerous specimens studied came from type locality.



LATERAL VIEW OF MALES

- Fig. 1. *Protolophus singularis* Banks.
 Fig. 2. *Protolophus differens*, new species.
 Fig. 3. *Protolophus dixiensis* Chamberlin.

Protolophus differens, new species

Figure 2

MALE.—Total body length, 5.0 mm. Cephalothorax, 1.8 mm.

	I	II
Trochanter	0.5 mm.	0.5 mm.
Femur	2.3	3.6
Patella	0.9	1.1
Tibia	2.3	3.8
Metatarsus	2.6	3.4
Tarsus	4.5	9.0
Total	13.1 mm.	21.4 mm.

	III	IV
Trochanter	0.5 mm.	0.5 mm.
Femur	2.7	4.1
Patella	1.0	0.9
Tibia	2.3	3.1
Metatarsus	2.9	4.5
Tarsus	4.1	5.4
Total	13.5 mm.	18.5 mm.

Dorsum sparsely granulate, few small, irregularly spaced blacked-tipped tubercles on the frontal margin of the cephalothorax. Abdomen with a pair of tubercles on the first five segments. Each tubercle armed with from three to eight small spines. The eye tubercle not canaliculate, with a series of small tubercles over each carina. Venter and coxae armed with numerous black hairs. Coxae I, II and IV armed both anteriorly and posteriorly with well-developed black teeth. Coxa III having teeth only on the anterior margin; teeth on posterior margin of coxa IV reduced in number. Genital operculum with few very small teeth on lateral margins and covered with black hair. Abdomen rounded as seen from above.

Palpus: trochanter, 0.5 mm. long; femur, 1.5; patella, 0.5; tibia, 1.1; and tarsus, 1.5. Total length, 5.1 mm. Width of femur, 0.5 mm. Femur curved, narrow, armed ventrally and dorsally with hair and black-tipped tubercles. Patella and tibia armed throughout with hairs. Tarsus armed ventrally with a few small black-tipped tubercles. Tarsal claw smooth and small.

Legs: trochanters smooth except for scattered black hairs. Legs armed throughout with black hairs.

Dorsum brownish gray, mottled with numerous white markings. Abdominal tubercles black. Eye tubercle dark brown. Venter light yellowish brown, coxae same, contrasting strongly with the black coxal teeth; venter and coxae also mottled with white. Trochanters concolorous with coxae, legs dark brown, mottled with white, not annulate in appearance. Palpus yellowish brown with white mottlings.

TYPE LOCALITY.—Male holotype from Mormon Lake, near Mesa, Arizona, June 23, 1936 (H. S. Ellsworth).

RELATIONSHIPS.—This form resembles most closely *P. dixiensis*. However, it differs in having a more mottled dorsum giving it a grayish appearance. The tarsus of the palpus is slightly longer than the tibia; whereas in *dixiensis* it is shorter. Also the palpi and the body are not so tuberculate as those of *dixiensis*. The legs lack the annulate appearance so characteristic of *dixiensis*, and the body is more strongly arched, rounded behind rather than subtruncate.

Protolophus niger, new species

Figure 5

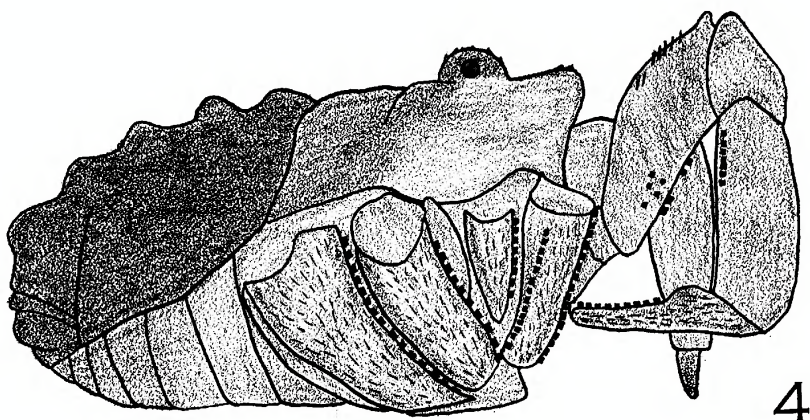
MALE.—Total body length, 5.0 mm. Cephalothorax, 1.7 mm.

	I	II
Trochanter	0.5 mm.	0.5 mm.
Femur	1.8	4.5
Patella	0.6	1.3
Tibia	1.9	3.8
Metatarsus	2.3	4.2
Tarsus	4.5	7.7
Total	11.6 mm.	22.0 mm.

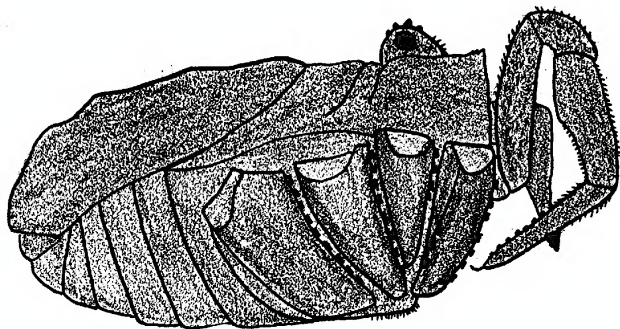
	III	IV
Trochanter	0.5 mm.	0.5
Femur	1.9	3.8
Patella	0.8	1.3
Tibia	1.8	2.7
Metatarsus	2.3	4.2
Tarsus	3.6	3.6
Total	10.9 mm.	16.1 mm.

Dorsum densely granulate; numerous irregularly spaced tubercles on the median frontal margin of the cephalothorax. The paired abdominal tubercles characteristic of the genus are reduced to very slightly elevated areas. The unspined tubercles are black and so low as to be discernible only with great difficulty at the proper angle. The eye tubercle not canaliculate, with a row of small tubercles over each carina. Venter slightly tuberculate and hairy. Coxae tuberculate; coxa I with a row of teeth on the anterior margin, and a few very small teeth on the posterior margin; coxa II having a few very faint teeth on the distal anterior margin, none on posterior margin; coxae III and IV having teeth on anterior margin only. Genital operculum having lateral margins covered with teeth and hair. Abdomen subtruncate as seen from above.

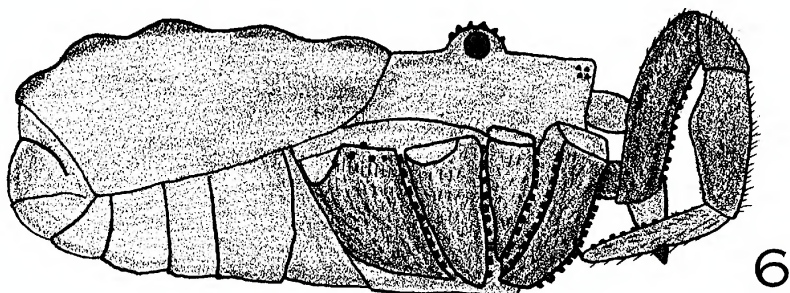
Palpus: trochanter, 0.5 mm. long; femur, 1.3; patella, 0.5; tibia, 1.1; tarsus, 1.4. Total length, 4.8 mm. Femur, 0.4 mm. wide. Fe-



4



5



6

LATERAL VIEW OF MALES

- Fig. 4. *Protolophus tuberculatus* Banks.
Fig. 5. *Protolophus niger*, new species.
Fig. 6. *Protolophus cockerelli*, new species.

mur curved, narrow for this genus, armed dorsally with hair, ventrally with hair and very small tubercles. Patella and tibia armed throughout with hairs; tarsus armed dorsally with hairs, and ventrally with hairs and a row of black tubercles. Tarsal claw smooth and small.

Legs: Trochanters smooth except for scattered hairs; remainder of legs armed throughout with hair.

Dorsum reddish brown, so densely covered with black granulations that it has a blackish cast. Occasional individuals lighter in appearance. Eye tubercle blackish. Venter dark brown, coxae darker, almost black. Trochanters also dark brown in appearance, legs deep brown, lighter distally. Palpus also dark reddish brown with black overcast.

FEMALE.—Total body length, 7.4 mm. Cephalothorax, 2.0 mm.

Similar to male except body rounded caudad. Abdomen more rounded and robust. General color lighter, dorsum and venter less tuberculate, giving a more mottled appearance.

TYPE LOCALITY.—Male holotype from Medford, Oregon, June 20, 1934 (Fred Lawrence). Female and male paratype from Rogue River Valley, Oregon, April, 1934 (Fred Lawrence).

RELATIONSHIPS.—This form is related to *P. tuberculatus* and *P. cockerelli* in having the dorsal abdominal tubercles unspined. It differs conspicuously from either in the great reduction of the abdominal tubercles and its darker coloration.

Protolophus tuberculatus Banks

Figure 4

P. tuberculatus BANKS, 1893, Canadian Ent., XXV, p. 206; 1901, Amer. Nat., XXXV, p. 674; 1902, Proc. United States Nat. Mus., XXV, p. 216; 1904, Proc. Calif. Acad. Sci., (3) III, p. 13. ROEWER, 1910, Abh. Ver. Hamburg, XIX, p. 263.—BANKS, 1911, Pomona J. Ent., III, p. 419.—Comstock, 1912, The Spider Book, p. 87; 1940, p. 87.—ROEWER, 1923, Die Weberknechte der Erde, p. 874, Fig. 1036.

MALE.—Total body length, 5.8 mm. Cephalothorax, 2.3 mm.

	I	II
Trochanter	0.7 mm.	0.7 mm.
Femur	2.3	3.6
Patella	0.9	1.1
Tibia	2.5	3.5
Metatarsus	2.7	3.6
Tarsus	3.6	6.3
Total	12.7 mm.	18.8 mm.

	III	IV
Trochanter	0.7 mm.	0.7 mm.
Femur	2.5	4.1
Patella	1.0	1.6
Tibia	2.0	3.0
Metatarsus	2.9	4.7
Tarsus	4.5	5.9
Total	13.6 mm.	20.0 mm.

Dorsum granulate, five rows of very small tubercles on the median frontal margin of the carapace. Abdomen with a pair of low, smooth unspined tubercles on the first five abdominal segments. Eye tubercle low, tuberculate, not canalliculate. Venter strongly tuberculate, coxae with rows of teeth on the anterior and posterior margin of I, anterior margins only of II, III and IV. Genital operculum tuberculate with lateral rows of teeth. Supra-cheliceral lamella in the form of a small, three-branched spine on either side of the median line. Abdomen subtruncate posteriorly as seen from above.

Palpus: trochanter, 0.7 mm. long; femur, 2.3; patella, 0.9; tibia, 1.8; and tarsus, 1.4. Total length, 7.1 mm. Femur, 0.9 mm. wide. Femur curved, heavy, dorsal surface smooth, ventral and lateral surfaces covered with hair and heavy tubercles. Tarsus narrow, armed dorsally with hair, ventrally with two marginal rows of black-tipped tubercles. Tarsal claw smooth and small.

Legs: covered with hair, trochanters smooth except for small black hairs.

Dorsum black, shading into reddish brown in the middle of the cephalothorax. Eye tubercle black. Ventral portion of carapace and coxae reddish brown. Venter of abdomen black. Trochanter of palpus reddish brown, femur brownish black, patella and tibia shading to reddish brown with tarsus reddish brown. Trochanters of legs yellowish, femur, patella and tibia black; metatarsus and tarsus yellow.

FEMALE.—Total body length, 7.2 mm. Cephalothorax, 2.3 mm.

Similar in appearance to male except for lighter dorsum, usually having a central stripe bordered laterally by a narrow light marking. A white spot often present on the median posterior margin of the abdomen. Palpi narrower than in male, having the patella spur characteristic of the females of this genus. Legs lighter, lacking the deep black color of the males. Abdomen more strongly arched and rounded posteriorly, tubercles slightly lower. Eye tubercle bearing a row of ten small spines above each carina.

TYPE LOCALITY.—Southern California (Banks, 1893).

RECORDS.—CALIFORNIA: Los Angeles, Claremont (Roewer, 1923); Mill Valley, Santa Rosa Island, Santa Catalina (Banks, 1904); San Francisco (new record). TEXAS (Roewer, 1923). ARIZONA: Wil-

liams (Banks, 1901). OREGON: Coquille (new record).

***Protolophus cockerelli*, new species**

Figure 6

MALE.—Total body length, 5.9 mm. Cephalothorax, 1.8 mm.

	I	II
Trochanter	0.6 mm.	0.6 mm.
Femur	1.8	2.6
Patella	0.6	0.9
Tibia	1.8	2.8
Metatarsus	2.0	2.5
Tarsus	3.6	6.3
Total	10.4 mm.	15.7 mm.
	III	IV
Trochanter	0.6 mm.	0.6 mm.
Femur	1.8	3.0
Patella	0.6	1.1
Tibia	1.8	2.3
Metatarsus	2.4	3.6
Tarsus	4.1	4.5
Total	11.3 mm.	15.1 mm.

Dorsum granulate, numerous small tubercles on the median frontal margin of the carapace. Principally distributed in two rows, running from the margin to the eye tubercle. Abdomen with a pair of very low unspined tubercles on the first five abdominal segments. Eye tubercle low, not canaliculate, a row of about six very small tubercles around each carina. Venter strongly tuberculate, coxae with rows of teeth; on both anterior and posterior margins of coxa I, on anterior margin only of II, III and IV. Supra-cheliceral lamella in the form of a small spine on either side of the median line. Genital operculum covered with black hair, having

lateral teeth. Abdomen rounded posteriorly as seen from above.

Palpus: trochanter, 0.6 mm. long; femur, 1.6; patella, 0.5; tibia, 1.4; and tarsus, 1.1. Total length, 5.2 mm. Femur, 0.4 mm. wide. Femur curved, narrow for this genus. A few tubercles above, heavily tuberculate and hairy below. Patella and tibia armed with hairs, tarsus armed with numerous hairs, and ventrally a row of small black tubercles on either side. Tarsal claw smooth and small.

Legs: trochanters unarmed except for black hairs; femur, patella and tibia with rows of black-tipped tubercles and scattered hairs. Metatarsus and tarsus armed only with hairs, margin of the femur, patella and tibia having a circle of spines.

Dorsum reddish brown, with numerous small black granules. Abdominal tubercles black, black mottling on carapace; eye tubercle black, lighter near the base. Venter and coxae yellowish with brown mottlings; palpus yellow with brown markings. Trochanters of legs yellowish, remainder of legs yellowish with brown markings.

TYPE LOCALITY.—Male holotype from San Clemente Island, California, May, 1939 (T. D. A. Cockerell).

RELATIONSHIPS.—This species is related to *P. tuberculatus* of the mainland. However, it differs in a number of characteristics. It is much lighter in color, the palpi are not so heavy, the tubercles of the anterior margin of the carapace are arranged differently, the abdominal tubercles are lower, and the color of the legs is paler, as it lacks the black femur, patella and tibia. In general appearance this species is lighter in color and smoother in appearance than is *P. tuberculatus* Banks.

